2.0 Site Operations and Maintenance

2.1 Annual Site Inspection

Evidence of significant erosion and IC violations must be inspected for annually, in accordance with RFLMA Attachment 2, Sections 5.3.4 and 5.3.6. The 2013 inspection was conducted on March 19, 2013, and reported in the *Rocky Flats Site Quarterly Report of Site Surveillance and Maintenance Activities, First Quarter Calendar Year 2013* (DOE 2013f).

The following categories were monitored during the inspection:

- Evidence of significant erosion in the COU and evaluation of the proximity of significant erosion to subsurface features in RFLMA Attachment 2, Figures 3 and 4. This monitoring included visual observation for precursor evidence of significant erosion (e.g., cracks, rills, slumping, subsidence, sediment deposition);
- The effectiveness of ICs, as determined by any evidence of violation; and
- Evidence of adverse biological conditions, such as unexpected morbidity or mortality, observed during the inspection and monitoring activities.

As part of the IC inspection, the Environmental Covenant's presence in the Administrative Record and in Jefferson County records was verified. This verification is required annually. In addition, physical controls (signs placed along the COU fence) were also inspected.

Marker flags were placed where conditions showed evidence of the three condition categories listed above, to track their location for follow-up by Site subject matter experts. Several areas were noted as having evidence of erosion and possible depressions, which were minor and very limited in area. The inspection forms and maps are included in Appendix A of the *Rocky Flats Site Quarterly Report of Site Surveillance and Maintenance Activities First Quarter Calendar Year 2013* (DOE 2013f).

Most inspection observations were related to metal debris on the surface or trash that was either picked up or marked for subsequent removal and pickup. Rocky Flats field operations subject matter experts subsequently visited the areas to determine if any observations were significant or required repairs and to collect debris. All items were closed out in the Site Observation Log.

No evidence of violations of ICs or physical controls was observed.

No adverse biological conditions were noted during the inspection.

2.2 Pond Operations

Three constructed ponds collect and manage surface-water runoff at the Site. The ponds are A-4 in North Walnut Creek, B-5 in South Walnut Creek, and C-2 near and alongside of Woman Creek. Ponds A-4, B-5, and C-2 are referred to as "terminal ponds" because they were the farthest downstream ponds in their respective drainages, but now they are the only constructed ponds in those drainages. All three terminal ponds were operated in a flow-through configuration for all of CY 2013.

Routine dam inspections, pond-level measurements, and piezometer measurements were performed as scheduled during the year. Annual dam mowing and vegetation removal was completed in September. Semiannual or quarterly (as applicable to specific dams) monument-movement surveys and inclinometer readings were also performed approximately as scheduled.

In compliance with the State of Colorado Rules and Regulations for Dam Safety and Dam Construction, a registered professional engineer periodically conducts a formal dam safety inspection for Dams A-4, B-5, and C-2.

Following the extremely high flows during September 11–13, 2013, emergency inspections of each dam were performed by Wright Water Engineers Inc. The inspections took place on September 16, 2013, and all dams were determined to be in good, safe operating condition (Response Level 0) and without substantial evidence of effects from the high flows.

The terminal dams were again inspected in November 2013. All inspected dams received a "satisfactory" condition rating and a recommended safe storage level of "full." To enhance dam safety, inspectors recommended that a visual inspection of the downstream slopes at A-4, B-5, and C-2 should be made regularly to look for slumping or bulging.

2.3 Landfills

The annual report of the results of inspections, monitoring data, and maintenance activities for the PLF and OLF is provided below.

2.3.1 Present Landfill

The PLF consists of an approximately 22-acre engineered RCRA Subtitle C–compliant cover over a former sanitary and construction debris landfill. A diversion channel surrounds the landfill and diverts storm-water runoff away from the landfill to No Name Gulch. The landfill has a passive seep interception and treatment system (the Present Landfill Treatment System [PLFTS]) installed to treat landfill seep water and Groundwater Intercept System water that discharges into the former Landfill Pond area. A gas extraction system is also built into the landfill to let subsurface gas vent to the atmosphere.

Subsidence and consolidation at the PLF is monitored by visually inspecting the surface of the landfill cover for cracks, depressions, heaving, and sinkholes. The landfill final construction site conditions are used as a baseline for comparisons made during Site inspections. In addition to the visual inspection, settlement monuments are used to evaluate the actual settlement at these specific locations compared to the expected settlement calculated in the final design. Nine settlement monuments were installed across the top of the landfill cap, and an additional six monuments are located on the east face of the landfill. The monuments were monitored quarterly for the first year and annually thereafter.

Inspections and monitoring tasks follow the format and protocol established in the PLF M&M Plan and include groundwater and surface-water monitoring, as well as monitoring subsidence and consolidation, slope stability, soil cover, storm-water management structures, and erosion in surrounding features. This monitoring is conducted so that corrective actions can be taken in a

timely manner. Monthly inspections were initiated in October 2005. Quarterly inspections were initiated in the fourth quarter of CY 2007 as described in RFLMA Contact Record 2007-08.

2.3.1.1 Inspection Results

Four quarterly inspections were performed at the PLF in CY 2013. The inspection process followed the format and protocol established in the PLF M&M Plan. No significant problems were observed during these inspections. Appendix C contains the landfill inspection forms for the fourth quarter of CY 2013; earlier 2013 inspection forms are included in the applicable quarterly reports.

PLF area surface-water and groundwater monitoring, and operation of the PLFTS, is covered in those respective sections of this report.

2.3.1.2 Slumps

On February 13, 2007, a slump was discovered on the south-facing hillside just east of the PLF. The slump is not on the PLF, and engineering review determined that it does not impact the PLF cover. The slump was likely caused by heavy snow conditions and influenced by the post-closure lower water levels in the Landfill Pond. Therefore, regrading the slump is not necessary; however, deep-rooted plants were planted in the slump area to promote stabilization. There were no significant changes to the slumping area in CY 2013.

2.3.1.3 Settlement Monuments

The annual survey was completed in December 2013. Results of the settlement monument survey indicate that settling at each monument does not exceed expected settlement calculated in the final design and therefore does not trigger any maintenance activity under the PLF M&M Plan.

2.3.2 Original Landfill

The OLF consists of an approximately 20-acre soil cover over a former solid sanitary and construction debris landfill. The final cover consists of a 2-foot-thick Rocky Flats Alluvium soil cover that was constructed over both a regraded surface and a buttress fill and then revegetated. The original surface was regraded to provide a consistent slope. A 20-foot-high, 1,000-foot-long soil mass buttress fill was placed at the toe of the landfill. Erosion is controlled by a series of diversion berms that carry storm-water runoff away from the cover to channels on the east and west perimeter of the cover.

The OLF is inspected monthly in accordance with the OLF M&M Plan (DOE 2009a).

2.3.2.1 Inspection Results

Twelve monthly inspections were performed at the OLF in CY 2013. The inspection process followed the format and protocol established in the OLF M&M Plan. Appendix C contains the landfill inspection forms for the fourth quarter of CY 2013; earlier 2013 inspections forms are included in the applicable quarterly reports.

OLF area surface-water and groundwater monitoring is covered in those respective sections of this report.

2.3.2.2 Settlement Monuments

The settlement monuments were surveyed in March, June, September, and December 2013. Survey data indicate that settling at each monument does not exceed expected settling calculated in the final design and therefore does not trigger any maintenance activity under the OLF M&M Plan.

2.3.2.3 Geotechnical Investigation and Repairs

Conditions that warranted further repair and that triggered further investigation were found at the OLF beginning in 2007. This resulted in a geotechnical investigation of the conditions and repairs and maintenance actions to address conditions. This work is summarized in the RFLMA annual report for 2009 and quarterly reports for 2010 (DOE 2010b, 2010a, 2010c, 2011a). In 2010 additional maintenance was completed that addressed cracking in the vicinity of Berm 1 and recontoured the eastern end of Berm 7 where the berm was slumping into the eastern perimeter channel. This work is fully described in the quarterly reports for the second and third quarters of CY 2010 (DOE 2010c, 2011a). Locations are shown on Figure 1.

2.3.2.4 Precipitation Response Repairs

Slumping and cracking were observed on the eastern part of the OLF cover in the vicinity of Berm 4 and the East Perimeter Channel following the unusually high precipitation received in September 2013. DOE notified CDPHE and EPA on September 17, 2013, that a reportable condition had been identified at the OLF. DOE, CDPHE, and EPA personnel toured the area on September 18 to start the consultative process to develop a proposed course of action. Contact Record 2013-02 documents the initial mitigating actions and the path forward to address the reportable condition. CDPHE approved this contact record on October 21, 2013. Repairs to the slumping and cracking areas were completed in September 2013 as reported in the third quarter report for CY 2013. The areas where repairs were completed were inspected weekly as a precautionary measure to help ensure that any new slumping or cracking could be addressed in a timely manner. Only minor cracking and slumping were observed during the fourth quarter in the locations where repairs were completed. These locations required minor filling and grading to close the cracks and prevent infiltration of precipitation as recommended by the geotechnical engineer. A project to complete maintenance on Berm 4 and to address slope stability in the East Perimeter Channel and surrounding area is scheduled to be completed during the summer of 2014. CDPHE approved Contact Record 2013-03 on December 4, 2013. The contact record summarizes the final grading plan and includes the Soil Disturbance Review Plan for the project.

Figure 1. Original Landfill Previously Observed Surface Cracking Location and Inclinometer Locations

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2.3.2.5 Inclinometers

Seven inclinometers were installed in boreholes at the OLF in 2008 as part of the geotechnical investigation (Figure 1).

Movement of the inclinometers has been monitored approximately monthly since installation. During the fourth quarter CY 2013, the inclinometers were monitored on October 31, November 27, and December 19.

Inclinometers deflect based on lateral movement of the ground in which the inclinometer is located and can deflect enough to cause the inclinometer tube to break. Once an inclinometer tube breaks, it will no longer be monitored. Inclinometer monitoring data provide information on localized soil movement and serve to focus periodic inspections of the soil cover surface on signs of potential instability, such as cracking, vertical displacement, and slumping. A deflection of more than 1 inch is used as a trigger for evaluation of the data by a qualified geotechnical engineer. The engineer determines the significance of the deflection in relation to recommendations for maintenance or repairs to address potential instability in accordance with the OLF M&M Plan (DOE 2009a).

During 2013, deflection of more than 1 inch was observed at two inclinometers. Inclinometer Tt-2, installed near the western edge of the landfill, experienced 1.5 inches of movement along the A axis, and 0.8 inches along the B axis. The area in the vicinity of inclinometer Tt-7, along the eastern edge of the OLF, experienced visible slope movement following the September precipitation event. Efforts to collect inclinometer data in late September indicated the inclinometer tube had likely broken at approximately 9 feet below ground surface due to the movement of the landfill slope. Readings taken during 2013 show that approximately 1.8 inches of movement had occurred in alignment with the A axis, and about 2.1 inches of total movement had occurred in alignment with the B axis through August 2013. During August and September 2013, 0.7 additional inches of deflection were recorded on the A axis, and 2 additional inches of deflection were recorded on the B axis. Appendix E contains the *Technical Memorandum Regarding Instrumentation and Monitoring at the Rocky Flats OLF,* which discusses the findings noted above.

The conclusion of the data review is that recommendations made in the 2008 geotechnical investigation remain valid. The instrumentation indicates that instability is caused by one or more weak layers in the shallow subsurface, and movement is exacerbated by precipitation events and elevated water levels. Slope stability modeling indicates that, on a large scale, the overall slope is stable. Localized failures occurred on the OLF during 2013 under elevated water level conditions. The 2014 regrading, as designed by the geotechnical engineer, may be useful in increasing slope stability along the eastern portion of the OLF.

2.3.2.6 Berm Height Evaluation

Contact Record 2013-02 noted that it appeared that runoff collected and conveyed by the diversion berms during the September heavy precipitation event was approximately 6 to 10 inches deep in the berm channels. As noted in Contact Record 2013-02, the RFLMA Parties agreed that the planned 2013 berm-height maintenance could be delayed until DOE could compare performance of the diversion berms in relation to this event and evaluate a possible

modification to the minimum berm-height criteria. A technical memorandum from the geotechnical subcontractor (see Appendix F) dated December 19, 2013, provides information on the data analysis and tabulates new minimum berm heights (in contrast to those that were previously calculated using more generic Colorado Front Range data). At a December 5, 2013, meeting, the RFLMA Parties reviewed this memorandum and agreed that OLF berm height maintenance can be based on the new calculated minimum berm heights. The new heights will be implemented as a field modification until the next OLF M&M modification is completed. The postponed 2013 berm height maintenance will be performed in summer of 2014 using the new berm-height criteria.

2.4 Groundwater Plume Treatment Systems Maintenance

Rocky Flats utilizes four groundwater treatment systems to reduce contaminant load before the water is discharged. The four systems are the Mound Site Plume Treatment System (MSPTS), the East Trenches Plume Treatment System (ETPTS), the Solar Ponds Plume Treatment System (SPPTS), and the PLFTS. Each of these was designed and installed to passively collect and treat groundwater. Before the Site closed, only the SPPTS had been modified to include an active—i.e., powered—component. However, since Site closure, additional active components have been required in order to meet the more stringent post-closure system objectives. Additional active components were initially added only to the SPPTS. However, in 2011 the MSPTS received active components, and in early 2013 those MSPTS active components were bolstered and similar components were installed at the ETPTS. Only the PLFTS remains fully passive.

This section focuses on the maintenance and operation of the MSPTS, the ETPTS, and the SPPTS during CY 2013. Additional information is in the previous quarterly reports from 2013 (DOE 2013f, 2013g, 2014).

Details of the monitoring of the treatment systems, including the PLFTS, are presented in Section 3.1.2.8, and interpretations related to system operation and the corresponding contaminant plumes are provided in Section 3.1.5.

2.4.1 Mound Site Plume Treatment System

The MSPTS treated groundwater throughout the year. Operation and maintenance of the treatment system was performed periodically and some modifications were made in CY 2013.

2.4.1.1 Flow

MSPTS flows are measured using two flow meters located in a configuration vault between the two zero-valent iron (ZVI)-containing treatment cells. The flow configuration through the treatment cells remained in a “parallel upflow” configuration throughout the year. In this configuration, influent is divided with approximately half the flow directed upward through the media in treatment Cell 1 and the other half upward through the media in Cell 2. The flow to each treatment cell is measured by a flow meter in the vault. Groundwater discharging from both treatment cells reenters the flow configuration vault and is combined before entering the effluent manhole, which is located just east of treatment Cell 2. This effluent water from the treatment cells is then processed by an air stripper installed within this manhole. Effluent from this

manhole is discharged to a small, subsurface vertical French drain and then to the larger subsurface discharge gallery.

2.4.1.2 Upgrades

Several modifications were made to the MSPTS during the year. Beginning in December 2012 and ending in March 2013, the prototype air stripper was upgraded to operate at a higher flow rate, and full time rather than 12 hours per day. (Refer to the annual report for 2012 [DOE 2013b] for details on this prototype unit.) The solar array was replaced with an expanded array and other electrical components. The original test pumps, which produced flow rates up to approximately 8 gallons per minute (gpm), were replaced with a more robust and powerful pump that produces flows close to 20 gpm. Additional sensors and electrical components were installed to optimize system monitoring and maintenance. The air stripper nozzle configuration was expanded from that used for the pilot version; tests had used up to 6 nozzles, while the upgraded air stripper began operating using 10 nozzles.

Air release piping was installed on the air stripper influent line in late summer to minimize the potential for air to accumulate in the pipe and restrict groundwater flow. The air release piping also provides access to the pipes for cleaning. Insulation was added to the flow configuration vault in early winter as additional freeze protection.

2.4.1.3 Maintenance

MSPTS maintenance in CY 2013 consisted primarily of routine activities such as removing biological growth and clayey iron oxide/oxyhydroxide accumulations from system components (primarily the air stripper pump, but also the air stripper spray nozzles, effluent manhole, and various pipes), releasing air accumulation from piping, and cleaning and servicing such components as flow meters and water-level transducers. Photos in Figure 2 show the nature of this biological/iron-oxide accumulation. More information on the project and its effects on water treatment is provided in Section 3.1.5.

Notes: The left photo shows nozzles that were removed from the air stripper because of clogging. The iron coloration on these brass nozzles is related to the air stripper processing effluent from the ZVI-containing cells. The center photo shows similar clogging of air stripper pump impellers, and the right photo shows the same component after the bulk of the clog has been removed.

Figure 2. MSPTS Air Stripper Components Showing Typical Clogging

Two data loggers used to remotely monitor the treatment system were updated with the latest software on May 14, and three of the four air stripper fans used to enhance volatilization of dissolved volatile organic compounds (VOCs) were replaced on July 31.

Additional maintenance activities performed in 2013 were mainly in response to the heavy rainfall in September. Minor flooding submerged both flow meters in the flow configuration vault, damaging one of them. The damaged meter was cleaned, dried, rewired, and put back into service. The high water levels also caused an electrical short in a water-level transducer located in the collection trench manhole. That transducer was replaced.

2.4.1.4 Operation

Operational activities are conducted to gather data, optimize performance, and control various treatment system functions. Routine activities in CY 2013 included controlling and adjusting flow through the treatment system, recording flow and pressure data, measuring water levels, and inspecting system components.

The MSPTS was shut off in January for 10 days while the air stripper upgrades were completed. The system was shut off again intermittently over the summer to help clear clogs, and to allow high levels in the treatment cells to drain prior to installing the air release on the air stripper influent line. The MSPTS was also shut off for 10 days in late summer to help reduce Functional Channel (FC)-4/South Walnut Creek flows during the GS10 flume replacement project. Water accumulated in the MSPTS groundwater intercept trench during each of these instances, and this water was treated after the system was reactivated.

For additional information on treatment system monitoring and performance, refer to Section 3.1.5.

2.4.2 East Trenches Plume Treatment System

The ETPTS treated groundwater throughout the year. Operation and maintenance of the treatment system was performed periodically, and several modifications and configuration changes were implemented in CY 2013.

2.4.2.1 Flow

ETPTS flows are measured using flow meters located in a metering vault adjacent to the two treatment cells. The flow configuration is controlled in a second vault located between these two cells.

Over the course of the year, the flow configuration at the ETPTS was changed on several occasions to both extend the lifetime of the treatment media and enhance treatment effectiveness. For most of the life of the current media, the flow direction has been upward through each cell. The anticipated result of this flow configuration is that the lowermost portions of the ZVI media would be relatively more oxidized and clogged than the uppermost media, due to this extended contact with dissolved oxygen and ions in the groundwater. As a result, the shallower ZVI (nearer the top of the media in each cell) would be expected to be relatively fresher and more reactive than the deeper material.

For the first half of the year, groundwater was routed through the treatment cells in series: upflow through Cell 1 and then downflow through Cell 2. This was revised in late May to the opposite series-flow configuration: upflow through Cell 2, and then downflow through Cell 1. In mid-August, the flow configuration was readjusted to parallel upflow, with the influent being split among the two cells and roughly half flowing upward through Cell 1, the other half upward through Cell 2.

Effluent from the individual treatment cells is routed back into the flow configuration vault (located between the cells), where the flow is combined and routed to the effluent manhole. From here it discharges to the subsurface discharge gallery.

2.4.2.2 Upgrades

Work was started in late 2012 and completed in the first quarter of 2013 to install an air stripper at the ETPTS. This technology was selected based on the success of the pilot-scale (also referred to as prototype) air stripper installed at the MSPTS in 2011, which treats approximately the same contaminants as are present in the influent at the ETPTS. However, whereas the MSPTS air stripper is located in the effluent manhole downstream of the ZVI-based treatment, the ETPTS air stripper was installed within the influent manhole, prior to any groundwater treatment. This manhole is located approximately 350 feet west of the treatment cells.

The manhole lid was first modified from one that was only slightly above ground level to one that extends several feet above the ground surface. This extension addresses health and safety concerns for staff working at the manhole, and also provides a few extra feet for air stripping and related components to support treatment. Also to support air stripper operation, the volume of collected groundwater in the influent manhole was increased by installing a vertical pipe extension on the manhole drain. A submersible pump was installed within the resulting pool of water, and it directs water to a nozzle assembly to provide spray aeration, much like that at the MSPTS. Four small exhaust fans were mounted on the manhole lid, with an air intake vent extending from the lid down into the manhole. A level, gravel pad was constructed adjacent to the manhole, and a power-supply facility was installed on this pad. The power facility consists of a conex to which solar panels are mounted, and which doubles as the battery housing.

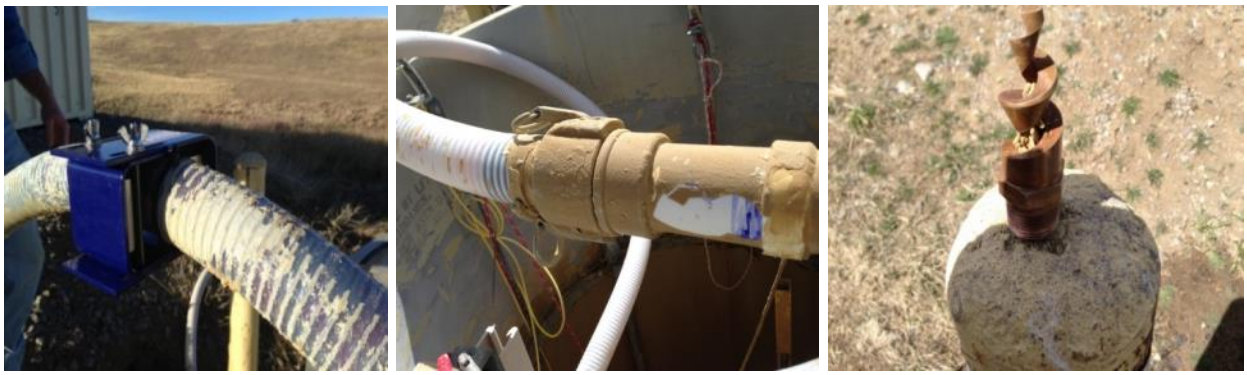
Air stripper configuration changes were made throughout the year to evaluate and optimize treatment and maintenance. Several different nozzle assemblies were tested and the submersible pump was changed once. The average flow rate through the pump remained about 20 gpm throughout the year. A lighter and more manageable lid was installed on the manhole in May. This air stripper successfully reduced the contaminant load by approximately an order of magnitude. Refer to Section 3.1.5 for additional information on the project and air stripper effectiveness.

Insulation was added to the metering and flow configuration vaults in early winter as additional freeze protection.

2.4.2.3 Maintenance

One important maintenance difference between the MSPTS and ETPTS air strippers was immediately noted upon activation of the ETPTS unit in early 2013. While the air stripper at the MSPTS is prone to biofouling and clogging with clayey iron oxide/oxyhydroxide particles, the air stripper at the ETPTS generates hard-water scale. These precipitates are related to the very hard groundwater at Rocky Flats. They do not represent a significant maintenance issue at the MSPTS air stripper because water routed through that unit has already been treated by the ZVI, which acts to reduce the concentrations of dissolved ions (such as calcium, magnesium, and bicarbonate) that contribute to form these precipitates. However, at the ETPTS, raw influent that contains these ions at relatively high, natural concentrations is routed through the air stripper.

Therefore, maintenance activities at the ETPTS in CY 2013 included substantial and repeated efforts to remove accumulations of hard-water scale from system components (primarily air stripper nozzles, pump, and an inline filter; see Figure 3). Other routine maintenance activities included flushing biological growth from piping and cleaning flow meters and water-level transducers. Two data loggers used to remotely monitor the treatment system were updated with the latest software on May 14, and four air stripper fans used to enhance volatilization of dissolved VOCs were replaced on July 31. Water-level transducers and flow meters were recalibrated in July. The heavy precipitation and flooding in September did not adversely affect any of the equipment at the ETPTS.



Notes: Left: Photograph of hard-water deposits on a hose that runs between between a pump and a nozzle. Center: Scale on a camlock fitting. Right: Scale accumulated in a nozzle.

Figure 3. ETPTS Air Stripper Components Showing Typical Scaling

2.4.2.4 Operation

Operational activities are conducted to gather data, optimize performance, and control various treatment system functions. Routine activities this year included controlling flow through the air stripper, modifying the nozzle configuration in the air stripper, recording flow and pressure data, measuring water levels, inspecting system components, and adjusting flows. The air stripper was shut off intermittently throughout the year for maintenance and reconfiguration. It was off for a prolonged period from the beginning of September through mid-November to identify and install a submersible pump better suited to handling hard-water scale. Other than normal maintenance, flow through the treatment cells was not shut off throughout the year.

For additional information on treatment system monitoring and performance, refer to Section 3.1.5.

2.4.3 Solar Ponds Plume Treatment System

The SPPTS treated groundwater throughout the year. Maintenance activities were performed periodically, and some operational adjustments and configuration changes were made in CY 2013.

2.4.3.1 Flows

SPPTS flows are measured using several flow meters, some of which are dedicated to specific components within the system. Total system flows are monitored by (1) a flow meter located on the influent line before water enters treatment cells and (2) a flow meter on the effluent line in a vault near the Solar Ponds Plume (SPP) Discharge Gallery. The flow of groundwater that is pumped from the Phase I Interceptor Trench System Sump (ITSS) over a distance of approximately 420 feet to the main influent collection sump (i.e., the SPPTS influent collection location known as SPIN) is also measured, as is flow directed through test components (including each Phase III cell and the microcell).

Flow Configuration

SPPTS influent is a mixture of water from the ITSS (which empties into the SPIN collection well) and water from the original groundwater intercept trench. These commingled waters are routed from SPIN through the small SPIN vault and then through a second vault (the metering vault). Within this metering vault, the influent flow is divided among the various components of the system for treatment and to support ongoing tests. The majority of this groundwater passes through the metering vault and enters the ZVI-filled Phase II treatment cell a few feet to the west, through which it moves in an upflow configuration. This water then flows by gravity to the original treatment Cells 1 and 2, located in the large concrete structure. A portion of the groundwater from the ZVI cell is pumped in timed pulses back through the metering vault, where this water is dosed with liquid carbon, and then into the two pilot-scale lagoons located just north of the metering vault. These Cell A and Cell B lagoons are supporting nitrate treatment tests. (Refer to Section 3.1.5 for a discussion of the operation and status of these lagoons to date.) Effluent from these lagoons flows by gravity to the original treatment Cells 1 and 2.

A portion of the groundwater entering the metering vault is diverted before entering the Phase II cell, flowing instead to the ongoing microcell tests, which are designed to evaluate a compact, simpler, and more efficient way to treat uranium (Section 3.1.5). Effluent from these tests also flows by gravity to the original treatment cells.

Groundwater from the Phase II cell, lagoons, and microcell flows to the original treatment Cells 1 and 2, and then gravity-flows approximately 420 feet to the east where it is piped through the effluent vault (i.e., the SPPTS effluent collection location known as SPOUT). As noted above, a flow meter located in this vault measures the effluent flow rate. From here, effluent flows to the subsurface discharge gallery.

Flow configuration did not change throughout the year. Several different forms of microcell media, typically comprising various grain sizes of ZVI, were tested over the course of the year. See Section 3.1.5 for more information on the SPPTS performance and the different tests.

2.4.3.2 Upgrades

Minor upgrades were installed at a few locations within the SPPTS in CY 2013. Most notable was the addition of an air release to the Phase III Cell B influent line in late summer to minimize the potential for air to accumulate in the pipe and restrict groundwater flow. In addition, an electrical plug was installed on the SPIN pump to ease its removal. **(Note:** This pump is not routinely removed, but when its removal is desired, having the ability to simply unplug it will be a big advantage over the previous hard-wired configuration.)

One change was made to the lagoon test equipment in January. After the recirculation pump in Cell A malfunctioned, it was removed. At that time, this pump represented the only operational difference between the pilot-scale lagoons in Cells A and B—flow rates, carbon dosing, and other test conditions were the same. The pump in Cell A was being used to determine whether water circulation improved nitrate treatment within the Cell A lagoon. Results (Section 3.1.5) indicated the pump was not beneficial, so it was not replaced.

2.4.3.3 Maintenance

SPPTS maintenance in CY 2013 primarily consisted of routine activities such as inspecting the various components, cleaning flow meters and lines, calibrating liquid carbon dosing pumps, cleaning temperature sensors and water-level transducers, and refilling the liquid carbon tank. Two data loggers used to remotely monitor the treatment system were updated with the latest software on May 14. Several times throughout the year, especially after heavy snow or rain, groundwater levels in the immediate area rose to the point that the open-bottom vaults became flooded. This water was pumped out of the vaults and into the original concrete treatment structure, sometimes daily, to protect system components. The rate of infiltration was high enough on several occasions to activate an automated shut-off switch, shutting down the entire treatment system. Water was usually pumped out and the system restarted within 24 hours. However, the heavy and prolonged rains in September flooded the vaults and submerged some system components. While some were restored to operation without ill effects, others were damaged, including the SPIN flow meter, the SPIN transducer, the SPIN pressure sensor, both liquid carbon dosing pumps, and the tubing between the liquid carbon storage container and dosing pumps. Damage to this tubing caused liquid carbon—the nutrient added to the pilot-scale lagoons to sustain the denitrifying bacteria within—to leak into the metering vault. The mixture of liquid carbon and water seepage was tested and then pumped into the original concrete treatment structure. Damaged components were replaced.

Weed-suppressant geotextile was added to the surface of the overburden in the original concrete structure in early spring. As has been the case in previous years, standing water was present on the surface of the overburden for part of the year, causing substantial growth of vegetation.

2.4.3.4 Operation

Operational activities are conducted to gather data, optimize performance, and control various treatment system functions. Routine activities this year included starting, stopping, and adjusting the rate of flow through the treatment system and its various components; recording flow, temperature, and pressure data; and measuring water levels. In addition, test microcells were removed after they clogged or data indicated they were not treating adequately, and new microcells were installed in their place.

Changes to flow rates most often focused on the SPIN pump, which delivers influent to all treatment components. The flow rate was typically increased to draw down the water present in the groundwater intercept trench, or was lowered to retain a nominal amount of water in the trench. Flows to Phase III Cells A and B were also adjusted on occasion, especially to Cell B (Section 3.1.5). The average rate of pumping from ITSS was also adjusted to manage the water level in this sump.

Flooding in mid-September resulted in the entire system being shut down for 10 days to allow repairs to damaged equipment. The system operated intermittently during this period while final repairs and adjustments were made.

For additional information on treatment system monitoring and performance, refer to Section 3.1.5.

2.5 Sign Inspection

"U.S. Department of Energy - No Trespassing" signs are required to be posted at intervals around the perimeter of the COU to notify persons that they are at the boundary of the COU. Signs listing the use restrictions (ICs) and providing contact information are also required to be posted at access points to the COU. The signs are required as physical controls of the remedy, are inspected quarterly, and are maintained by repairing or replacing signs as needed. Physical controls protect the engineered components of the remedy, including landfill covers, groundwater treatment systems, and monitoring equipment, which are also inspected routinely during monitoring and maintenance activities.

The signs were inspected quarterly as required and met the requirements.

2.6 Erosion Control and Revegetation

The existing erosion controls are maintained and repaired to protect the bare soil areas until the vegetation can stabilize the soil. Areas lacking sufficient vegetation cover are assessed and typically reseeded. In some cases, soil amendments are added to help establish the native vegetation. Additional information on the revegetation activities conducted at the Site during 2013 is provided in Section 3.2.6.

2.6.1 Erosion Control

Maintenance, repair, replacement, and monitoring of the Site erosion control features continued as needed through 2013. Assessing the erosion control is especially important following high-wind events that are common at the Site and after significant precipitation events, such as

those experienced in September. Repairs in 2013 included re-staking (or weighting with rocks) wattles or erosion blankets that had loosened. The *Erosion Control Plan for the Rocky Flats Property Central Operable Unit* (DOE 2007b) was followed for various projects conducted in 2013. The plan addresses the regulatory approach, the monitoring inspections, and the applicability and scope of erosion control activities at the Site. It outlines the responsibilities, BMPs, and implementation aspects for erosion control activities before, during, and after projects.

2.7 General Site Maintenance and Operations

The Site is managed and maintained, and activities are conducted, pursuant to DOE's jurisdiction and control responsibilities. These activities help maintain the general condition of the Site through BMPs. Highlights of routine and nonroutine maintenance and operations in 2013 are described below.

2.7.1 Site Road Upgrades

2.7.1.1 Site Road Upgrades 2013

The Site Road Upgrades 2013 Project was completed in July 2013. Heavy equipment was used to regrade and compact sections of the existing road surfaces across the Rocky Flats Site including the west access road. Additional 3/4-inch rock was added to help strengthen the road surface. Additional road repairs were performed in November 2013 to repair damage caused by the high-precipitation events in September.

2.7.2 Site Security

A USFWS officer was assigned to the Rocky Flats National Wildlife Refuge (also called the Refuge) to perform nonroutine security evaluations as well as to respond to any security events on the refuge. LM can utilize the services of the USFWS enforcement officer, when available. In addition, LM has a Memorandum of Understanding with the Jefferson County Sheriff to pursue law enforcement on the COU.

No security infractions were noted on the COU during CY 2013.